Protocol Development Summary

NETN protocol: Rocky Intertidal

NETN parks where protocol will be implemented:
Acadia NP (ACAD), Boston Harbor Islands NRA (BOHA)

Justification/issues being addressed:
Rocky intertidal systems are composed of a suite of organisms that are adapted to a harsh environment that is subjected to extremes of exposure and temperature. This system is attractive to park visitors because of its scenic beauty and for shoreline exploration. The plants and animals of this community are adversely affected by contaminants, invasive species, and collection and disturbance by park visitors. The rocky intertidal habitats of Acadia and Boston Harbor Islands are a significant natural resource, and they need to be monitored so that appropriate usage levels can be determined.

There is a paucity of information about the species assemblages of the rocky shoreline at these parks, with the exception of a recent inventory at Boston Harbor Islands (Bell et al 2003). Effective protection of this habitat requires baseline data now to determine what species are present and to understand how key components of this land/water interface ecosystem respond to natural environmental variations and human impacts. These data will help parks assess the effectiveness of management actions and assist in the evaluation of impacts of catastrophic events, such as an oil spill.

Specific monitoring questions and objectives to be addressed by the protocol:

1. Survey intertidal zone widths at ACAD and BOHA, and determine trends over time in zone widths
2. Characterize algal and invertebrate species diversity and abundance, and determine spatial and temporal trends in diversity and abundance
3. Determine the abundance of keystone herbivores and predators within the low intertidal zone.
4. Detect new invasive exotic invertebrate and plant species
5. Evaluate the impact of key abiotic factors, including ice scouring and storms, on rocky intertidal communities
6. Determine whether visitor activities (e.g., trampling, rock turning, and collecting) have a negative impact on rocky intertidal resources
7. Evaluate whether anthropogenic contaminants are present in marine waters around ACAD and BOHA in sufficient concentrations to impact intertidal biota

Basic approach:
A new project led by Dr. Susan Brawley (University of Maine) will begin in 2006 to assess the condition of the rocky intertidal habitat at Acadia's former navy base lands on Schoodic peninsula. This project will compare rocky intertidal sites across a gradient of visitor use within the park. The general design for the field studies will be an asymmetric Before-After Control-Impact (BACI) design (Underwood 1994), which means that a series of "control" sites will be studied in addition to the site of most interest (the relatively undisturbed former navy base lands)

and these studies will be repeated in 4 cycles over 2 years. This experimental design allows natural temporal and spatial variation at a site to be separated from variation caused by other impacts (Murray et al. 2002). The study will begin in summer 2006 with an initial quantitative assessment of foot traffic in the intertidal zones of each of the 5 sites, currently and from historical records of the NPS. In September and October (2006), researchers will test all methodology at the Invertebrate Critical Area on Schoodic Point and nearby Grindstone Neck to establish exact quadrat numbers and point-counts/quadrat (i.e., a preliminary study/power analysis); they will also conduct the first zone width-determination at each of the 5 sites. They will analyze these data, and establish detailed monitoring protocols prior to the first detailed field sessions; these protocols will be provided to Acadia and the NETN by April, 2007. Detailed monitoring will begin in May 2007 and be repeated three times at all sites (July 2007; May 2008; July 2008); data will be fully analyzed in the months following each field session**.** A final report will be available for ANP staff by September 2008.

The NETN will build on and support this project by providing funds for a post-doctoral researcher to begin work in the spring or summer of 2007. This researcher will work with Dr. Brawley to evaluate the Acadia monitoring protocols and develop a long-term monitoring protocol for ACAD and BOHA rocky intertidal habitats. Key issues to be addressed will be:

1) Determining the location and number of long-term study sites at each park that will be needed to ensure a representative sample large enough to detect ecologically important trends
2) Revising sampling procedures to ensure that they efficiently meet the objectives of the protocol
3) Developing analytical procedures for understanding the data, and devising thresholds for metrics that are suitable for the network's reporting needs
4) Field-testing protocols at ACAD and BOHA

Principal investigators and NPS lead:
This protocol will be developed by the University of Maine under a cooperative agreement with PI Susan Brawley. NETN network coordinator Brian Mitchell is the NPS lead.

Development schedule, budget, and expected interim products:
Protocol development will begin in summer 2007, draft protocols will be submitted by spring 2008. Field testing of these draft protocols will occur during the 2008 field season, and updated SOPs will be submitted by spring 2009.

The budget for development of this protocol is estimated to be $60,000 in 2007 and $40,000 in 2008, which includes partial salary for a post-doctoral associate responsible for drafting SOPs, and costs for field testing draft protocols.

Literature cited:
Bell, R., M. Chandler, R. Buchsbaum, & C. Roman. 2003. Inventory of intertidal habitats: Boston Harbor Islands, a National Park Area. National Park Service Technical Report NPS/NERBOST/NRTR-2004/1, available at http://www.nps.gov/nero/science.

Murray, S. N., R. F. Ambrose & M. N. Dethier. 2002. Methods for Performing Monitoring, Impact, and Ecological Studies on Rocky Shores. U. S. Dept. of the Interior, Minerals Management Service, Camarillo, CA, 210 pp.

Underwood, A. J. 1994. On beyond BACI: sampling designs that might reliably detect environmental disturbances. Ecol. Appl. 4, 3-15.